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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/619,001	07/15/2003	Yasuaki Tsuchiya	8017-1095	6042
466	7590	12/01/2004	EXAMINER	
YOUNG & THOMPSON 745 SOUTH 23RD STREET 2ND FLOOR ARLINGTON, VA 22202			KENNEDY, JENNIFER M	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/619,001

Applicant(s)

TSUCHIYA ET AL.

Examiner

Jennifer M. Kennedy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/15/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, and 6-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsai et al. (U.S. Patent No. 6,524,167).

In re claim 1, Tsai et al. disclose the method of manufacturing a semiconductor device, comprising the steps of:

forming a sunken section (311) in an insulating film (310) formed on a substrate (see column 6, lines 58-65);

forming a barrier metal film (312) on said insulating form inclusive of said sunken section;

forming a copper based film (313) over the entire surface so as to fill up said sunken section; and

forming a copper based metal interconnection, which comprises the step of polishing this substrate surface by the chemical mechanical polishing method, using a polishing slurry containing a silica polishing material, an oxidizing agent, and amino acid, a triazole-based compound and water, wherein a content ratio of said amino acid

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to said triazole-based compound (amino acid to said triazole-based compound (weight ratio)) is 5 to 8 (see column 5, lines 12 through column 6, line 46, and column 7, lines 30-55). The examiner notes that although the composition of the slurry is given in volume percentages, when converted to weight percentages, Tsai et al. disclose a range of weight percentages that include the claimed weight percentage ratio.

In re claim 2, Tsai et al. disclose the method of manufacturing a semiconductor device, comprising the steps of:

forming a sunken section (311) in an insulating film (310) formed on a substrate (see column 6, lines 58-65) ;

forming a barrier metal film (312) on said insulating form inclusive of said sunken section;

forming a copper based film (313) over the entire surface so as to fill up said sunken section; and

polishing this substrate surface by the chemical mechanical polishing method to form a copper-based metal interconnection, wherein said step of polishing comprises the steps of:

a first polishing which is performed until at least a part of said barrier metal film is exposed, while using a polishing slurry containing a silica polishing material, an oxidizing agent, and amino acid, a triazole-based compound and water, wherein a content ratio of said amino acid to said triazole-based compound (amino acid to said triazole-based compound (weight ratio)) is 5 to 8 (amino acid triazole-based compound

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(weight ratio)) is 5 to 8 (see column 5, lines 12 through column 6, line 46, and column 7, lines 30-55 and Figures 3 and 4); and

a second polishing which is performed until the surface of the insulating film other than said sunken section is exposed (see column 7, lines 55-68).

The examiner notes that the although the composition of the slurry is given in volume percentages, when converted to weight percentages, Tsai et al. disclose a range of weight percentages that include the claimed weight percentage ratio.

In re claim 3, Tsai et al. disclose a method wherein said barrier metal film is a tantalum-based metal film (see column 7, lines 5-6).

In re claim 4, Tsai et al. disclose the method wherein the amino acid is glycine (see column 5, lines 27-30).

In re claim 6, Tsai et al. disclose the method wherein a content of said triazole based compound is not less than 0.05% by weight but not greater than 0.5% by weight (see column 5, lines 12 through column 6, line 46, and column 7, lines 30-55). The examiner notes that the although the composition of the slurry is given in volume percentages, when converted to weight percentages, Tsai et al. disclose a range of weight percentages that include the claimed range of weight percentages.

In re claim 7, Tsai et al. disclose the method wherein a pH value of said polishing slurry is in a range of 5 to 7 (see column 6, lines 4-10)

In re claim 8, Tsai et al. disclose the method wherein said silica polishing material is colloidal silica (see column 5, lines 60-62).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. (U.S. Patent No. 6,524,167) in view of Watts et al. (Japanese Patent Application Laid open No. 11-238709, provided in IDS).

Tsai et al. disclose the method as claimed and rejected above including some examples of triazoles, but does not disclose the method wherein the triazole based compound is a 1,2,4 triazole or its derivative. Watts et al. teaches the method of using a 1,2,4 triazole or its derivative (see specification of instant application, page 3, line 23 through line 5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a 1,2,4 triazole or its derivative since Watts et al. teaches that a 1,2,4 triazole may be used as a corrosion inhibitor and since it has been held to be within the general skill of the worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Claims 1-4, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sinha et al. (U.S. Patent No. 6,551,935).

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In re claim 1, Sinha et al. disclose the method of manufacturing a semiconductor device, comprising the steps of:

forming a sunken section (see Figure 2) in a film formed on a substrate (12);

forming a barrier metal film (18) on said insulating form inclusive of said sunken section;

forming a copper based film (20) over the entire surface so as to fill up said sunken section; and

forming a copper based metal interconnection, which comprises the step of polishing this substrate surface by the chemical mechanical polishing method, using a polishing slurry containing a silica polishing material, an oxidizing agent, and amino acid, a triazole-based compound and water, wherein a content ratio of said amino acid to said triazole-based compound (amino acid to said triazole-based compound (weight ratio)) is 5 to 8 (see column 5, lines 50 through column 6, line 40 and column 9, lines 14-23).

The examiner notes that the weight percent ranges of amino acid and triazole based compounds taught in Sinha et al. include the claimed weight percent ratio.

Sinha et al. does not explicitly disclose that the sunken region is formed in an insulative film. Sinha et al. does disclose that an insulating film underlies the barrier and copper films that are being polished (see column 6, lines 10-20). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sunken in region in an insulative layer because it allows for isolation of the copper lines in an interconnect which prevents shorting.

In re claim 2, Sinha et al. disclose the method of manufacturing a semiconductor device, comprising the steps of:

forming a sunken section (see Figure 2) in a film formed on a substrate (12);

forming a barrier metal film (18) on said insulating form inclusive of said sunken section;

forming a copper based film (20) over the entire surface so as to fill up said sunken section; and

polishing this substrate surface by the chemical mechanical polishing method to for a copper-based metal interconnection, wherein said step of polishing comprises the steps of:

a first polishing which is performed until at least a part of said barrier metal film is exposed, while using a polishing slurry containing a silica polishing material, an oxidizing agent, and amino acid, a triazole-based compound and water, wherein a content ratio of said amino acid to said triazole-based compound (amino acid triazole-based compound (weight ratio)) is 5 to 8 (see column 5, lines 50 through column 6, line 40 and column 9, lines 14-23); and

a second polishing which is performed until the surface of the insulating film other than said sunken section is exposed (see Figure 5).

The examiner notes that the weight percent ranges of amino acid and triazole based compounds taught in Sinha et al. include the claimed weight percent ratio.

Sinha et al. does not explicitly disclose that the sunken region is formed in an insulative film. Sinha et al. does disclose that an insulating film underlies the barrier and copper films that are being polished (see column 6, lines 10-20). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the sunken in region in an insulative layer because it allows for isolation of the copper lines in an interconnect which prevents shorting.

In re claim 3, Sinha et al. disclose the method as claimed and rejected above in a first embodiment, but do not the method wherein said barrier metal film is a tantalum-based metal film. Sinha et al. disclose in another embodiment the method wherein said barrier metal film is a tantalum based metal film (see column 1, lines 40-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the barrier metal film of Sinha et al. first embodiment with tantalum nitride because as Sinha et al. teaches tantalum is a suitable material and that it is interchangeable with tungsten (see column 1 line 40 through column 2, line 15) and because it has been held to be within the general skill of the worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

In re claim 4, Sinha et al. disclose the method wherein the amino acid is glycine (see column 6, lines 25-30).

In re claim 7, Sinha et al. disclose the method wherein a pH value of said polishing slurry is in a range of 5 to 7 (see column 6, lines 5-8).

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sinha et al. (U.S. Patent No. 6,551,935) in view of Watts et al. (Japanese Patent Application Laid open No. 11-238709, provided in IDS).

Sinha et al. disclose the method as claimed and rejected above including some examples of triazoles, but does not disclose the method wherein the triazole based compound is a 1,2,4 triazole or its derivative. Watts et al. teaches the method of using a 1,2,4 triazole or its derivative (see specification of instant application, page 3, line 23 through line 5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a 1,2,4 triazole or its derivative since Watts et al. teaches that a 1,2,4 triazole may be used as a corrosion inhibitor and since it has been held to be within the general skill of the worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sinha et al. (U.S. Patent No. 6,551,935) in view of Asano et al. (U.S. Patent No. 6,679,929).

In re claim 8, Sinha et al. disclose the method as claimed and rejected above, but does not disclose the method wherein said silica polishing material is colloidal silica. Asano et al. disclose the method of using colloidal silica as the abrasive material for a polishing slurry (see column 3, lines 58-60). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize colloidal silica because as Asano et al. teach it is a preferred material for an abrasive in a polishing

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slurry and because it has been held to be within the general skill of the worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Kennedy whose telephone number is (571) 272-1672. The examiner can normally be reached on Mon.-Fri. 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on (571) 272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jennifer M. Kennedy
Patent Examiner
Art Unit 2812

jmk